

Spot Safety Project Evaluation

Project Log # 200712085

Spot Safety Project # 06-99-211

**Spot Safety Project Evaluation of the Realignment and Signal Installation
At the Intersection of US 401 Bus (Ramsey St) and Rosehill Road
City of Fayetteville, Cumberland County**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

Jason B. Schronce

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 06-99-211 – The Intersection of US 401 Business (Ramsey Rd) and Rosehill Road within the City of Fayetteville in Cumberland County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the combination of the roadway realignment, lane reassignment, and the installation of a multiphase actuated traffic signal. In the before period, US 401 Business (Ramsey Street) was a six-lane undivided facility at the subject intersection with no dedicated turn lanes and a speed limit of 45 mph. Rosehill Road is also a 45 mph facility that provides a left turn lane and skewed dual right turn lanes at the tee intersection with Ramsey Street. The intersection was controlled by stop signs on Rosehill Road separated with concrete channelization islands. The intersection improvements included realigning Rosehill Road in order to bring the dual right turn lanes under signal control, installing a multiphase traffic signal, and reassigning the northbound thru-left approach to a continuous center turn lane with dedicated left turn only at the subject location.

The original statement of problem concluded that high left and right turning volumes were creating long queues and therefore frustrating motorists, which has resulted in large crash patterns. The intersection met signal warrants 1, 2, 8, 9, and 11.

The initial crash analysis was completed from May 1, 1996 to April 30, 1999 with 53 reported crashes, 40 of which were deemed correctable. The final completion date for the improvement at the subject intersection was on September 2, 2002 with a total cost of \$110,000.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from July 1, 2002 to October 31, 2002. The before period consisted of reported crashes from July 1, 1997 through June 30, 2002 (5 years); and the after period consisted of reported crashes from November 1, 2002 through October 31, 2007 (5 years). The ending date for this analysis was determined by the date of available data at the time of analysis.

The treatment data consisted of all crashes within 150 feet of the subject intersection. These limits also include the intersections of Rosehill Road at Sunset Drive and Ramsey Street at Jones Street. *Please see attached location map, photos, and collision diagrams for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that three different patterns were observed for target crashes of the applied countermeasures:

1. Realignment Target: Rear-End Crashes on the Rosehill Road approach
2. Lane Reassignment: Northbound Ramsey Left Turn Lane Rear-End Crashes
3. New Signal Target: Intersection Frontal Impact Collisions

The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	78	62	- 20.51 %
Total Severity Index	5.08	5.47	7.68 %
Target Crashes 1 – Realignment	33	3	- 90.91 %
Target Crash 1 Severity Index	6.61	1.00	- 84.87 %
Target Crashes 2 – Lane Reassignment	9	2	- 77.78 %
Target Crash 2 Severity Index	5.11	4.70	- 8.02 %
Target Crashes 3 – New Signal	16	21	31.25 %
Target Crash 3 Severity Index	4.24	3.47	- 18.16 %
Combined Target Crashes	58	26	- 55.17
Volume	37,100	39,700	7.00 %
<u>Injury Crash Summary – Total Crashes</u>			
Fatal injury Crashes	0	2	200.00 %
Class A injury Crashes	0	0	N/A
Class B injury Crashes	5	1	80.00 %
Class C Injury Crashes	38	16	- 57.89 %
Total Injury Crashes	43	19	- 55.81 %

The naive before and after analysis at the treatment location resulted in a 20.5 percent decrease in Total Crashes, a 55 percent decrease in overall Target Crashes, and a 56 percent decrease in the Total Injury Crashes. The before period ADT year was 1999 and the after period ADT year was 2005.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 20.5 percent decrease in Total Crashes and an 55 percent decrease in Overall Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the largest portion of crashes at the intersection in the before period (33 of 78) were low speed impact Rear-End collisions turning right from the skew onto Ramsey Street from Rosehill Road. After the signal installation, this pattern (Target 1) was significantly reduced to just three (3), which was a 91 percent reduction. Target 2 (NB Ramsey Turn Lane Rear-Ends) also experienced significant reduction with the reassignment from thru-left to left only which prevented fast moving vehicles from suddenly experiencing stopped traffic waiting to turn left onto Rosehill Road.

The only crash pattern that increased after the applied countermeasures was left turn; same roadway as motorists attempted to turn left on Rosehill traveling northbound. From the table below, this pattern increased 67 percent with the highest occurrences happening during the mid-day hours. The movement is currently under protected-permitted signal phasing.

Ramsey Left Turn; Same Roadway			
Time of Day Analysis	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	9	15	66.67 %
Night / Early Morning (0000 – 0559)	0	1	100.00 %
Morning Rush (0600 – 0959)	1	1	0.00 %
Daytime (1000 – 1559)	2	6	200.00 %
Evening Rush (1600 – 1959)	4	4	0.00 %
Late Evening / Night (2000 – 2359)	2	3	50.00 %

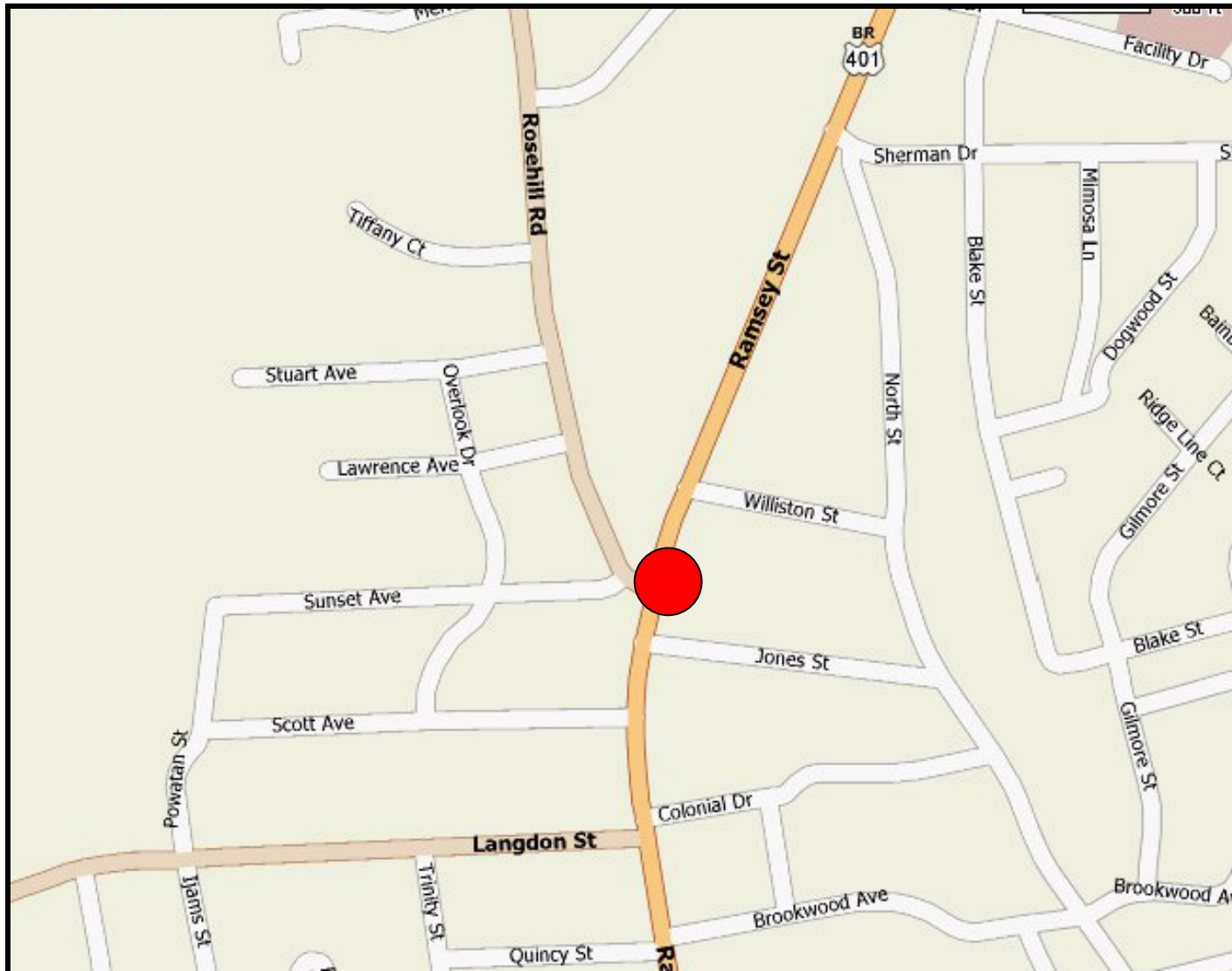
There was also an increase in Rear-End Crashes in the mainline (Ramsey St) through movements at the intersection (from 3 to 11). No other new crash patterns are apparent in the after period.

The calculated benefit to cost ratio for this project is -5.78 considering total crashes. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

The total benefit to cost ratio observed in this project is negative due to the high crash cost of the two after period fatality collisions (crashes 32 and 33). Both of these crashes were Ran-off Roadway accidents resulting from poor driving conditions or excessive speed on a motorcycle. The countermeasures installed under this analysis could not and were not intended to prevent these types of crashes. Overall, this project appears to have affected the subject intersection positively.

Please see the attached *Treatment Site Photos*. Photos are provided for the three approaches to the treatment intersection. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

Location Map
Cumberland County, City of Fayetteville
Evaluation of Spot Safety Project # 06-99-211



Treatment Location: US 401 Business (Ramsey Street) at Rosehill Road

SS# 06-99-211 Aerial Map
Cumberland County, City of Fayetteville



TREATMENT SITE PHOTOS TAKEN 4/8/2008



Traveling East on Rosehill Road



Traveling North on US 401 Business (Ramsey Street)



Traveling South on Ramsey Street

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: Ramsey at Rosehill
COUNTY: Cumberland
FILE NO.: SS 06-99-211

BY: JBS
DATE: 4/16/2008
NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - Realignment and New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$110,000	10	0.149	\$16,393
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS	\$110,000	10	0.149	\$16,393
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ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$2,200
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$900
TOTAL ANNUAL COST=	\$19,493
TOTAL COST OF PROJECT=	\$110,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

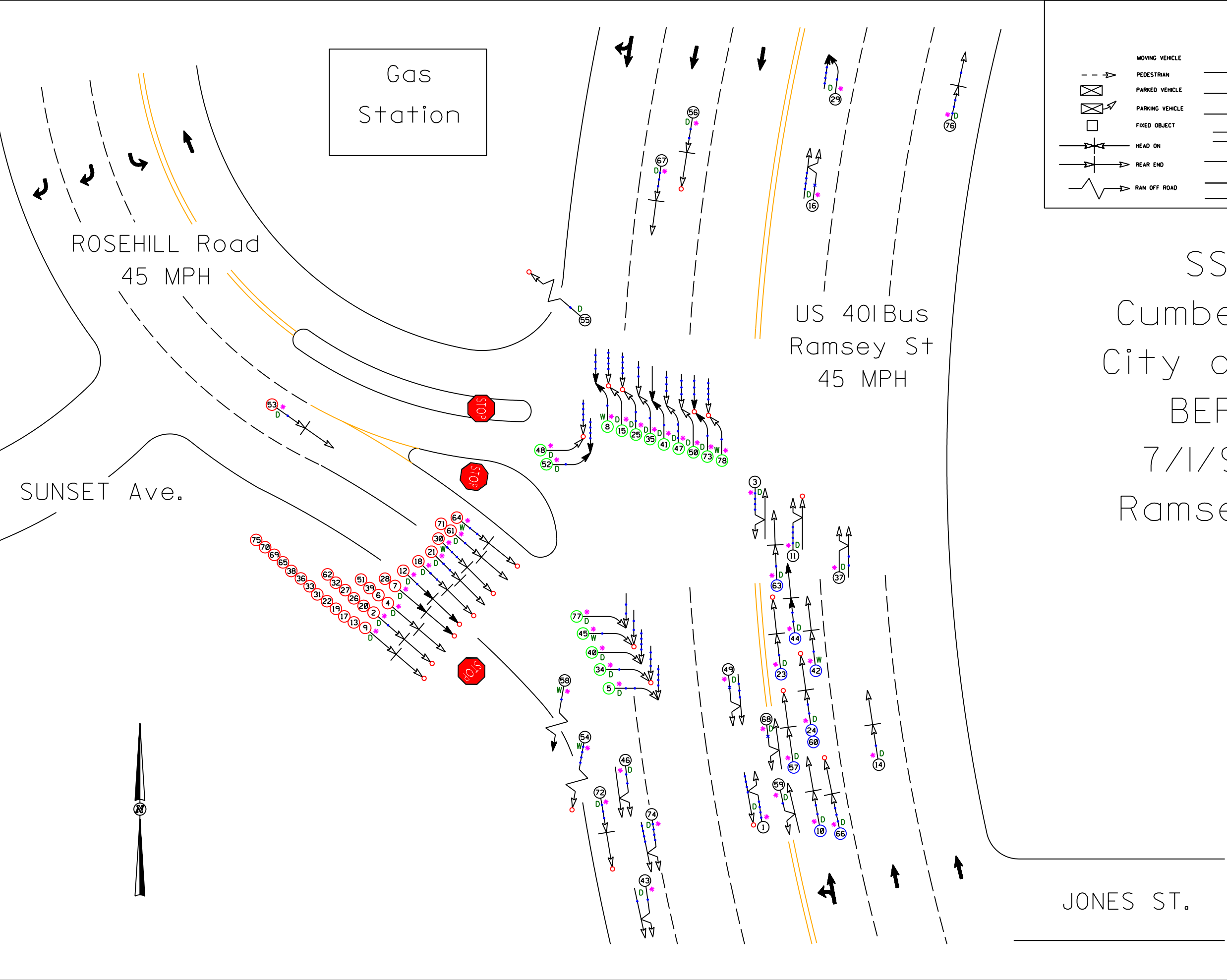
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.00	0	0.00	43	8.60	35	7.00	\$182,100
AFTER	5.00	2	0.40	17	3.40	43	8.60	\$294,740

Annual Benefits from Crash Cost Savings (\$112,640)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$132,133)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -5.78

TOTAL COST OF PROJECT	-	\$110,000	COMPREHENSIVE B/C RATIO	-	-5.78
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LEGEND

MOVING VEHICLE

PEDESTRIAN

PARKED VEHICLE

PARKING VEHICLE

FIXED OBJECT

HEAD ON

REAR END

RAN OFF ROAD

ANGLE

TURNING

BACKING

SIDESWIPE

OUT OF CONTROL

INJURY

FATALITY

9 MPH OR LESS

10 MPH TO 19

20 MPH TO 29

30 MPH TO 39

40 MPH TO 49

50 MPH TO 59

60 MPH TO 69

70 AND UP

SPEED UNKNOWN

PEDESTRIAN

TRAIN

DRIVER AT FAULT

DRY

WET

ICY OR SNOWY

OILY

SS# 06-99-211

Cumberland County

City of Fayetteville

BEFORE Period

7/1/97 - 6/30/02

Ramsey at Rosehill

Target Crashes

#

ROSEHILL Rear-End

#

Lane Designation Change

#

Intersection Frontal Impact

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

HIGHWAY SAFETY PLANNING AND ANALYSIS

HIGHWAY SAFETY IMPROVEMENT PROGRAM

HIGHWAY SAFETY MANAGEMENT

RAILROAD-HIGHWAY SAFETY MANAGEMENT

DIVISION: 6

AREA: 2

STUDY PERIOD: 7/1/1997 - 6/30/2002

DISTANCE: Y-LINE = 150FT

ANALYSIS PREPARED BY: JBS

ANALYSIS CHECKED BY: BR

DIAGRAM PREPARED BY: JBS

DIAGRAM REVIEWED BY: ST

SCALE: NOT TO SCALE

DATE: 4-15-2008

LOG NUMBER: SS# 06-99-211

N.C. DEPARTMENT of TRANSPORTATION

DIVISION of HIGHWAYS

TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

06-99-211 collision diagrams.dgn 6/30/2008 9:43:49 AM

